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CLINICAL STUDY

Advantages of endoscopic transsphenoidal pituitary gland tumor surgery

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ABSTRACT

OBJECTIVE: The aim of the study was to hihglight the benefits and safety of the endoscopic transsphenoidal pituitary gland tumor surgery.

BACKGROUND: The endoscopic transsphenoidal approach to the Turkish sella minimizes traumatization of nasal cavity structures, allows direct access to the tumor and intra, para and suprasellar views (13).

METHODS: The surgical procedure was described. We monitored postoperative complication such as postoperative bleeding, cerebrospinal fluid leak, infection in 136 patients who underwent endoscopic transsphenoidal pituitary gland tumos resection.

RESULTS: Bleeding from the bed after tumor removal occured in 3 patients (2.2 %). Bleeding from the nasal cavity requiring surgical intervention was in 1 patient (0.7 %). Postoperative cerebrospinal fluid leak was detected in 12 cases (8.8 %). Duroplasty with itratecal cerebrospinal fluid drainage led to the cessation of the cerebrospinal fluid leak in all cases. We recorded meningitis in 4 patients (2.9 %) Rhinosinusitis was not recorded.

CONCLUSIONS: The endoscopic transsphenoidal surgery of pituitary gland tumors has become preferred becouse of its safety, low rate of complications and minimal trauma to the patient *(Fig. 5, Ref. 13)*. Text in PDF *www.elis.sk*

KEY WORDS: endoscopic transsphenoidal approach, pituitary gland.

Introduction

Pathological lesions in the area of the Turkish sella are manifested by headaches, visual field defects, visual acuity disorders and hormonal imbalance from a violation of the hypothalamo-pituitary axis with corresponding clinical symptomatology. MRI determines the exact location of the tumor, its size (macroadenoma, microadenoma), its relationship to the surrounding structures and to the healthy part of the pituitary gland. All adenomas that cause hormonal hypersecretion and mechanical oppression of neurostructures are indicated for surgical treatment. Treatment requires a multidisciplinary approach. The indication for pituitary surgery is in the hands of the endocrinologist, neurologist, ophtalmologist, neurosurgeon, otorhinolaryngologist and radiologist. It is up to the neurosurgeon to choose the surgical approach. In the present, the most adenomas are removed via an endoscopic transsphenoidal approach, which requires otorhinolaryngologist – rhinosurgeon to make an approach to pituitary gland. Transnasal transsphenoidal endoscopic approach is minimally invasive and the most gentle to the structures of the nasal cavity (1, 2, 3, 4). This approach enables the selective removal of the tumor and preserve the healthy part of the pituitary gland (5).

Material and methods

Endoscopic transsphenoidal resection of the pituitary tumors was realized on 136 subjects at the Neurosurgery clinic of the L. Pasteur University Hospital in Košice from January 2012 to December 2022.

Each patient undergwent an ENT examination, which includes a rhinoendoscopy, MRI and CT in order to identify the anatomical situation in the nose, sphenoid sinus and Turkish sella (Fig. 1). Anatomical obstacles such as deviation, crista, spina of the nasal septum, concha bullosa were corected intraoperatively. Acute rhinosinusitis or acute exacerbation of chronic rhinosinusitis was a contraindication to surgery.

The surgical procedure of endoscopic transsphenoidal resection of pituitary tumor was described in the article. Complication such as bleeding, cerebrospinal fluid leak and infection were monitored postoperatively.

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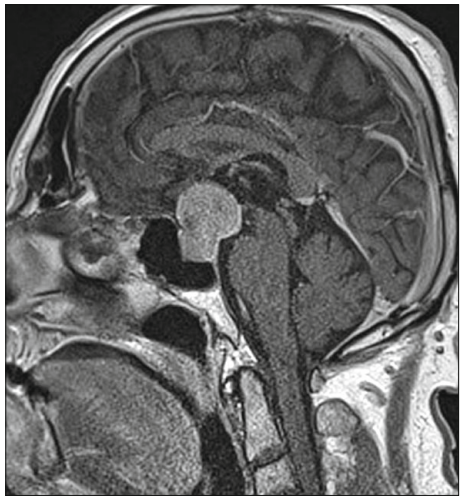

Fig. 1. MRI – sagital projection of pituitary gland adenoma.

Surgical technique

ENT part

Before the actual surgical procedure, we apply gauze soaked in a solution (Mesocain 10 ml + Adrenaline 2 ml) to the nasal cavity and leave it for approximately 30 minutes. Vasoconstriction induced in this way causes decongestion of the nasal mucosa, thereby making the surgical field more transparent and minimizing intraoperative bleeding. The patient lies on his back under general anesthesia, the head is fixed in slight extension and anteflexion, it can be slightly rotated to the side towards the surgeon. Peroperative computer navigation is used to improve orientation in the operating field. During the surgery, we use an endoscope with 30-degree optic with rinsing. We perform a sphenoidotomy through the front wall of the sphenoidal sinus in the sphenoetmoidal recess on both sides. The first task is to identify the natural ostium of the sphenoidal sinus (Fig. 2). Ostium is located paramedially approximately 1–1,5 cm above the choana at the level of the posterior end of the superior nasal concha. A better overview can be achieved by lateralizing the middle nasal concha using a Freer elevator or by resecting its posterior end. Deviation, crista or spina of nasal septum which prevents the manipulation of instruments can be removed endoscopically. In the case of a bullous middle nasal concha, we resect its lateral part. After identification of natural sphenoid sinus ostia, we widen them downwards and medially using Kerison forceps or shaver on both sides. We can create nasoseptal flap. It is used to cover the opeing to the sella. Subsequently, we resect the dorsal part of the bony septum (vomer), rostrum sphenoidale and intersinous septum. In order to prevent unwanted breaking of the surrounding bone, the intersinus septum can be removed with a diamond bur. In this way, we obtain a wide open mutual sphenoid cavity (Fig. 3), which allows binostral manipulation of instruments during the neurosurgical phase of the surgery. The posterior wall has a typical shape conditioned by the balloon prominence of the

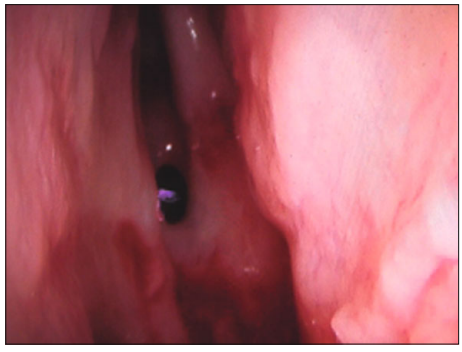

Fig. 2. Ostium of sphenoidal sinus.

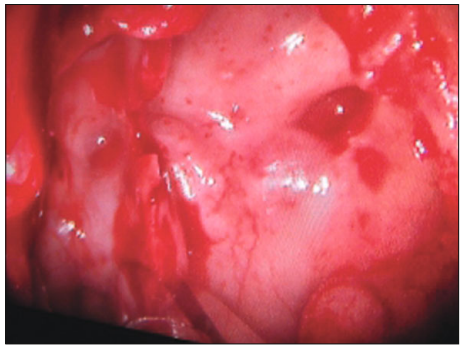

Fig. 3. Wide open mutual sphenoid cavity.

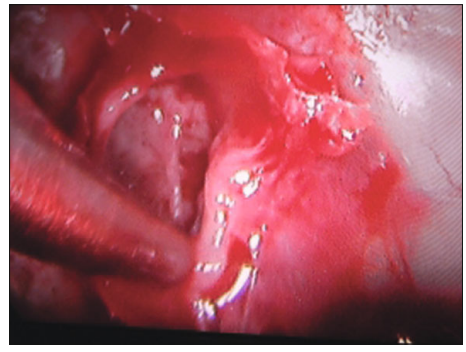

Fig. 4. Resection of pituitary gland macroadenoma.

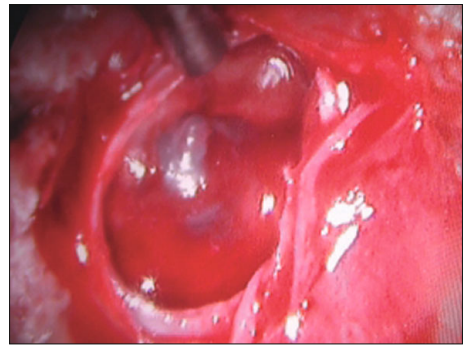

Fig. 5. Sella after pituitary gland macroadenoma removal.

Turkish sella. It is important to identify the structures of the lateral wall, where there are two arches conditioned by the course of optic nerv – up and internal carotid artery – below. Sometimes they are barely marked, other times they create a deep lateral recess below the optic nerve and above internal carotid artery or even below it. Very important is the fact that the bone canal of the internal carotid is partially dehiscent in up to 25 % of cases (6).

Neurosurgical part

After removal of mucous membrane from the posterior wall of the sphenoid sinus, the bone of Turkish sella is opened with diamond drill and widened. Incision of dura mater is performed and in case of macroadenoma, the tumor is exposed. A sample is taken for histological examination and then the tumor is carefully removed using suction and blund curettes not injure diaphragma and healthy part of pituitary gland (Figs 4 and 5). Peroperative navigation is very helpfull in this part of surgery and increases safety. In case of microadenoma using peroperative navigation is mandatory. It helps identify the localisation of the tumor.

Reconstruction part

After endoscopic resection of the tumor, hemostatic material is inserted to cavity, mucosa is returned in place to close opening to the pituitary gland. Hemostatic material, Gelaspon or fibrin foam is placed into the sphenoidal sinus. In case of cerebrospinal fluid leak sandwich duroplasty is done using fascial grafts in combination with tissue glue. Nasoseptal flap placed into the sphenoid cavity significantly decreases postoperative cerebrospinal fluid leak. We tampon the sphenoid sinus and nasal cavity with Gelaspon.

In the postoperative period, we treat the nasal cavity in the same way as for other endoscopic procedures in the area of the nose and paranasal sinuses. During endoscopic treatment after decongestion of the nasal mucosa, we aspirate mucus and remove crusts that can cause obstruction of the nasal cavity. We carry out treatments in two-day intervals. Rhinoendoscopic postoperative care allows early identification of postoperative cerebrospinal fluid leak and its solution. Perioperatively and postoperatively, patients are covered with antibiotics that pass through the blood-brain barrier. Moistening of the mucous membrane with physiological solution and application of topical corticosteroids accelerates postoperative healing in the nasal cavity. In the postoperative period, endocrinological treatment of the patient is important.

Results

Bleeding from the bed after tumor removal occured in 3 patients (2.2 %). Bleeding from the nasal cavity requiring surgical intervention (sphenopalatine artery koagulation) was in 1 patient (0.7 %). Postoperative cerebrospinal fluid leak was detected in 12 cases (8.8 %). Duroplasty with itratecal cerebrospinal fluid drainage led to the cessation of the cerebrospinal fluid leak in all cases. We recorded meningitis in 4 patients (2.9 %) Rhinosinusitis was not recorded. Created mutual sphenoidal cavity was re-epithelialized with mucosa in all patients within two months. Wide opened mutual sphenoidal cavity ensures very good ventilation and drainage, which prevents its inflammation.

Discussion

Mastering the surgery technique of functional endoscopic sinus surgery (FESS) enables operations with a target organ outside the nasal cavity, paranasal sinuses and nasopharynx. One of the indications is endoscopic surgery of pituitary tumors through the sphenoid cavity (6). Endoscopic endonasal access to the sellar region was first described by Jankovsky in 1992 (7). Carrau (8), Jho (9) and Cappabianca et al (1, 2, 3) are the main representatives who popularized this approach. Other proponents include Schwartz (10), who enriched this technique with the intraoperative use of MRI (11). Computer navigation also plays an irreplaceable role, which enables better orientation in the operative field, greater radicality during resection and significantly increases the safety of the procedure. The endoscopic transsphenoidal approach brings with it several advantages. It minimizes the traumatization of the structures of the nasal cavity, allows very good illumination of the operative field and direct access to the tumor without retraction of the brain, as is the case with the transcranial approach (12). Neurostructures are shifted cranially. Compared to the microscopic technique, endoscopes with angled optics allow lateral, intra- and suprasellar views (13). Of the listed reasons why up to 95 % of pituitary adenomas are surgically treated with an endoscopic transsphenoidal approach (6). Tumors that spread significantly supra, parasellar, anteriorly along the base, or solid tumors may require a transcranial approach. Pneumatization of the sphenoid sinus can also be a limiting factor. Surgery of pituitary adenomas requires an interdisciplinary approach. The indication for pituitary surgery is in the hands of the endocrinologist, neurologist, ophtalmologist, neurosurgeon, otorhinolaryngologist and radiologist. It is up to the neurosurgeon to choose the surgical approach. In the present, the most adenomas are removed via an endoscopic transsphenoidal approach, which requires otorhinolaryngologist – rhinosurgeon to make an approach to pituitary gland. The otorhinolaryngologist preoperatively assesses the anatomical conditions in the area of the nasal and sphenoid cavities. In the case of acute rhinosinusitis or acute exacerbation of chronic rhinosinusitis, transsphenoidal surgery in the region of the Turkish sella is contraindicated. If the situation requires surgical treatment in the area of paranasla sinuses is primarily performed and pituitary suregery is done as the second step. An otorhinolaryngologist – rhinosurgeon as a member of the operating team performs a transsphenoidal approach to the sella. Wide approach to the sella enables binostral acces to the pituitary gland and four-handed surgery. The resection of the pituitary tumor itself is performed by a neurosurgeon. Making of the approach by a rhinosurgeon who is used to working with an endoscope in the nasal cavity significantly shortens the duration of the operation, reduses mucosal injury with subsequent formation of adhesions in nasal cavity. In the postoperative period, endoscopic examination enables early detection of possible CSF. In our file postoperative cerebrospinal fluid leak was detected in 12 cases (8.8 %). Sandvich duroplasty

with itratecal cerebrospinal fluid drainage led to the cessation of the cerebrospinal fluid leak in all cases. Using nasoseptal flap to cover sella opening significantly reduces postoperative cerebrospinal fluid leak. Nasoseptal flap should be used if the diaphragma is injured. Postoperatvie bleeding has two reasons. Bleeding from the bed after pituitary tumor removal and bleeding from nasal cavity. Bleeding from the bed after tumor removal occured in 3 patients (2.2 %). Bleeding from the nasal cavity requiring surgical intervention (sphenopalatine artery koagulation) was in 1 patient (0.7 %) The first must be treated by neurosurgeon by bipolar coagulation or applying hemostiptic material to the postoperative cavity. Bleeding from nasal cavity is usually stoped by insertion of hemostyptic material to the nasal cavity. It rarerly requires surgical intervention. Sphenopalatine artery ligation is very effective, because bleeding is usually caused by injury of its branches nourishing mucosa in the area of the sphenoid sinus opening, posterior part of lateral wall of nasal cavinty and posterior part of nasal septum. We recorded meningitis in 4 patients (2.9 %), which was treated by antibiotics. The newly created wide communication between the sphenoid cavity and the nasal cavity ensures its sufficient ventilation and drainage, which acts as a preventive measure against the development of sinusitis or mucocele. Low rate of complications

Conclusion

The endoscopic transsphenoidal surgery of pituitary gland tumors has become preferred becouse of its safety, low rate of complications and minimal trauma to the patient. Using endoscopes with angel optics together with computer navigation makes possible to remove suprasellar and parasellar portion of macroadenomas and detect location of microadenomas in the tissue of the healthy pituitary gland. Cooperation between neurosurgeon and rhinosurgeon reduce trauma to the patient, make surgery safer, shortens duration of surgery and improves the results.

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